

CORROSION PROTECTION TAPE

This invention relates to a corrosion protection tape or anti-corrosive tape for the electrochemical protection of metal structures or members against corrosion.

5 Corrosion protection tapes, such as corrosion protection vinyl adhesive tapes described in JIS (Japanese Industrial Standards) Z1901 "Pressure sensitive adhesive polyvinyl chloride tapes for corrosion protection", have been used for preventing corrosion of metal structures
10 or members such as pipes situated in corrosive environments such as in the atmosphere, in sea water and in the soil.

These tapes are wound or wrapped around the metal structures or members either at the site of manufacture of

the metal members or structures or on sites at which the metal members are used. In either case, the corrosion may occur due to ingress or entry of water through spaces between overlapped portions of the tape
5 caused by incomplete initial taping or occurring long after taping. In some cases, a coating or filler is applied inside the tape prior to the taping to prevent the ingress of water, and thus, to improve its reliability for corrosion protection. However, this involves extra
10 work and increases cost.

A sacrificial anode system is also used for electrochemically protecting the metal member against the corrosion. In this system, the metal member to be protected is electrically connected to a metal, which forms
15 a galvanic sacrificial anode, having a low electrode potential and excellent galvanic characteristics, such as magnesium, aluminum, zinc or alloys thereof, so that the corrosion of the metal member may be prevented by a current flowing therebetween.

20 Since the conventional corrosion protection tape is formed by an extensible plastic sheet such as polyethylene or polyvinyl chloride on which a pressure sensitive adhesive is applied, its permeability is low as is its absorbability of water vapour, and thus, the
25 quantity of water permeating through the surface of the sheet or tape is extremely less than that of the water

entering through the overlapped portions of the tape. Therefore, the corrosion can substantially be prevented only by preventing the ingress or entry of the water through the overlapped portions. However, it is extremely difficult to accomplish perfect overlapping due to structural reasons in the wound tape.

However, said electrochemical protection can advantageously be used against corrosion by the water entering between the overlapped portions of the tape, if an appropriate tape is developed.

Accordingly, it is an object of the invention to provide a corrosion protection tape in which metal structures or members to be protected are electrochemically protected against the corrosion by water which may enter between the overlapped portions of the tape and/or through the surface of the tape.

With this object in view the present invention provides a corrosion protection tape comprising an elongate sheet having inner and outer surfaces, an adhesive layer coated on said inner surface, and particles of metal, forming a galvanic sacrificial anode for electrochemical protection, disposed closely to each other on a longitudinally extending area of said adhesive layer, said area having a width smaller than that of said

adhesive layer and being spaced widthwise from both longitudinal edges of the adhesive layer or the sheet so that the particles and a part of said adhesive layer between said area and one of said edges may directly contact a member to be protected, and a part of said adhesive layer between said area and the other of said edges may overlap the outer surface of the sheet wound around the member.

The invention will be described further, by way of example, with reference to the accompanying drawing in which:-

Fig. 1 is a plan view of a preferred embodiment of the corrosion protection tape of the invention;

Fig. 2 is a cross-section of the preferred embodiment of Fig. 1;

Fig. 3 is comparable with that of Fig. 1, but showing the preferred embodiment of the tape in its stretched or extended condition;

Fig. 4 is cross-section of the tape as shown in Fig. 3; and

Fig. 5 shows the preferred embodiment of the tape of Figs. 1 to 4 'in situ' on part of a pipe.

Referring firstly to Figs. 1 and 2, the preferred embodiment of the corrosion protection tape comprises an

elongate sheet 1 made from extensible material, e.g. plastics such as polyethylene or polyvinyl chloride, and a pressure sensitive adhesive layer 2 applied on one (inner) surface of the sheet 1. The corrosion protection vinyl adhesive tape prescribed in the aforesaid JIS Z1901 may be used as the sheet 1 and the adhesive layer 2. A plurality of microscopic metal particles 3

are adhered closely to each other on an area of the adhesive layer 2 on the elongate plastics sheet 1. The particles 3 are made from metal such as magnesium, aluminum, zinc, or alloys thereof, and form a galvanic sacrificial anode for the purpose of electrochemical protection. The area of the particles 3 has a width L2 which is smaller than that of the adhesive layer 2 or sheet 1 and extends longitudinally adjacent one longitudinal edge 4 of the sheet 1 which also happens to be one of the edges of the adhesive layer 2. Thus, a narrow particle free strip having a width L1 is formed between said area of particles 3 and said one edge 4, and a wider particle free strip having a width L3 is formed between said area and the other longitudinal edge of the sheet 1 (and adhesive layer 2). Assuming that the strip of width L of the sheet 1 is 50 mm the strip width L1 may be 5mm and the strip of width L2 is 25mm. Although each particle 3 for the galvanic sacrificial anode may have any one of a number of various shapes, it is preferably round in shape without any sharp ends and edges so as to prevent the cutting thereof into the plastics sheet 1. It is preferable also that the particles 3 be small in size again so as to prevent their cutting into the plastics sheet 1. However, the minimum size of the particles 3 is limited so as to

keep the effect thereof as the galvanic sacrificial anode. Therefore, when zinc is used as the galvanic sacrificial anode, the particles 3 of zinc have a weight of 0.01 mg per particle (corresponding to a diameter of 0.14mm in a spherical particle).

The particles 3 can be adhered onto the adhesive layer 2 by means of for example, spraying by compressed air.

Figs. 3 and 4 illustrate the corrosion protection tape 1 when it is extended by a predetermined amount.

As illustrated in Fig. 3, the particles 3 are longitudinally spaced from each other due to the extension of the plastic sheet 1. Since the whole of the plastics sheet 1 is uniformly extended through its entire length, the particles 3 are uniformly spaced and dispersed, so that the electrochemical protection effect thereof against the corrosion can be maintained uniformly through the entire length of the sheet.

The corrosion protection tape described above can advantageously be used as illustrated in Fig. 5 wherein the tape, which is designated by the letter T, is wound around a metal member to be protected, such as the illustrated pipe P, with the adhesive layer 2 and the particles 3 directed towards the outer surface of the pipe P. In the winding or taping operation of the pipe P,

the tape T is slightly inclined with respect to the circumferential direction of the pipe P so that the tape T under its extended condition is wound on the pipe P in order that the tape overlaps itself by half of its width. In this respect, that half of the tape T having the area of particles 3 is wound on the pipe so that the particles contact the pipe P directly. The strip of the tape T having the width L1 adheres directly to the outer surface of the pipe P and the strip of the tape T having the width L3 adheres to (e.g. overlaps) the outer surface of the tape T which is already wound on the pipe P. Thus, the tape T is fixedly wound around the pipe P and provides substantially the same waterproof effect as the conventional tape. In the wound tape T, the particles 3 are pressed onto the metal pipe P by the plastics sheet 1, so that good electrical connection is maintained between the particles 3 and the pipe P, providing sufficient electrochemical protection against the corrosion. If water enters onto the surface of the pipe P through the surface or overlapped portions of the tape T, a galvanic current flows between the pipe P and the particles 3, which form a cathode and an anode of a cell, respectively, so that the surface of the metal pipe P does not corrode, and this effect is maintained as long as the particles 3 exist.

The narrow strip (having width L1) of the adhesive layer 2 provides sufficient adhesion for the tape to the metal pipe P. Therefore, although the tape includes the non-adhesive particles 3 which directly contact the metal pipe P, the tape can be prevented from sliding on the pipe P in the lengthwise direction of the pipe P, and, thus, the tape can be maintained in good wound condition even when the metal pipe thermally expands or contracts.

In the described preferred embodiment the overlapping ratio is substantially 1/2. However, this may be 1/3 or 1/4, by changing the width and/or position of the area for the particles 3.

An example of the specification of the corrosion protection tape according to the invention is shown in the following table 1.

TABLE 1

Material of sheet	Polyvinyl chloride
Thickness of sheet.. ..	0.27mm
Width of sheet	50mm
Adhesive.. ..	Pressure sensitive adhesive of synthetic rubber

Thickness of adhesive		..0.13mm
Material of particles		..Pure zinc(>99.99%)
Shape of particle		..Sphere
Particle size		..120 - 150 μ m
Density of particles (in weight)		..about 0.042 g/cm ²
Density of particles (in number)		..about 4500 /cm ²
Mean total area of surfaces of particles		..about 2.5cm ² /cm ²

In accordance with Table 1, when the tape is wound around the pipe with the overlapping ratio of 1/2 and extension rate of 10%, the weight of the zinc particles fixed on the surface of the metal pipe is about 0.04 gram per 1cm². This amount is substantially equivalent to that of the zinc which can be plated on the pipe. Thus, the tape has its inherent corrosion protection effect as well as the electrochemical corrosion protection effect equivalent to that which can be achieved by zinc plating the pipe. Therefore, it has an excellent and reliable corrosion protection effect.

The force for applying a predetermined tension to the tape during the winding operation is substantially equivalent to that required in the winding operation of the conventional tape. Furthermore, the tape including

the particles can smoothly and easily be wound around the pipe as compared with a tape on which zinc foil or thin zinc sheet is adhered. Therefore, the winding operation of the tape according to the invention can be performed easily and similarly to that of the conventional tape, and it does not require special technique and tools.

As described above, the corrosion protection tape according to the invention has the protection ability against the corrosion, which is equivalent to that of the conventional tape, by virtue of its close adhesion, as well as the protection ability by virtue of the electrochemical function of the particles for the galvanic sacrificial anode against the possible entry or ingress of the water. Thus, the reliability of the corrosion protection ability can be remarkably increased without special winding technique.

CLAIMS

1. A corrosion protection tape comprising an elongate sheet having inner and outer surfaces, an adhesive layer coated on said inner surface, and particles of metal, forming a galvanic sacrificial anode for electrochemical protection, disposed closely to each other on a longitudinally extending area of said adhesive layer, said area having a width smaller than that of said adhesive layer and being spaced widthwise from both longitudinal edges of the adhesive layer or the sheet so that the particles and a part of said adhesive layer between said area and one of said edges may directly contact a member to be protected, and a part of said adhesive layer between said area and the other of said edges may overlap the outer surface of the sheet wound around the member.

2. A corrosion protection tape as claimed in claim 1 wherein the widthwise spacing of the area of particles from one said longitudinal edge is smaller than the widthwise spacing of said area from the other said longitudinal edge.

3. A corrosion protection tape as claimed in claim 1 or 2 wherein the width of that part of the adhesive layer for directly contacting the member is smaller than the width of that part of the adhesive layer for overlapping the sheet.



4. A corrosion protection tape as claimed in claims 1, 2, or 3 wherein the elongate sheet is made of extensible material.

5. A corrosion protection tape as claimed in claim 4 wherein the tape is plastics.

6. A corrosion protection tape substantially as hereinbefore described with reference to and as illustrated in the accompanying drawing.

